

## PATENT SPECIFICATION (11)

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## (54) A WORK PIECE SUPPORT ASSEMBLY FOR USE IN ELECTRO-PLATING

(71) We, LUCAS ELECTRICAL LIMITED formerly known as The Lucas Electrical Company Limited, a British Company, of Well Street, Birmingham, 19, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to a support assembly for use in electro-plating a workpiece in the form of an elongated strip formed of an electrically conductive, magnetic material.

15 According to the invention, a support assembly for use in electro-plating a workpiece in the form of an elongated strip formed of an electrically conductive, magnetic material includes a casing formed with an elongated slot adapted to receive a portion of the workpiece so that, during electro-plating, the electro-plating solution is substantially prevented from coming into contact with said portion of the workpiece, a terminal member to which external electrical connections can be made in use, a contact piece received within the casing and electrically connected to the terminal member, and a magnet received within the casing and so disposed relative to the contact piece and said slot that when said portion of the workpiece is inserted in the slot the portion is urged, by the attraction of said magnet, into engagement with the contact piece so that the workpiece is electrically connected to the contact piece and said terminal member.

35 Preferably, the contact piece is formed of a magnetic material and conveniently is formed of steel.

40 Preferably, the external surface of the contact piece presented to the slot in the casing defines a groove shaped so that the portion of the workpiece is inserted into said slot the portion is urged by said magnet into said groove in the contact piece.

45 Preferably an elongated electrode rod is supported in the casing and is electrically connected to the terminal member, and a plurality of contact pieces and magnets are

mounted on the electrode rod and are arranged alternately along the length of the rod.

Conveniently, there are a plurality of said elongated slots in the casing angularly spaced around the longitudinal axis of the electrode rod whereby a plurality of said workpieces can be supported by the assembly.

In the accompanying drawing,

Figure 1 is a sectional view of part of a workpiece according to one example of the invention, and

Figure 2 is a plan view of part of a workpiece for use with the assembly shown in Figure 1.

Referring to the drawings, the assembly includes a hollow, cylindrical casing 11 which is formed of an insulating material and which is divided into segments by a plurality of equi-angularly spaced slots 12 extending along the length of the casing 11. At each end, the casing 11 is closed by a synthetic resin end cap 13 and supported between the end caps 13 is an elongated, conductive electrode rod 14 extending coaxially with the casing 11. The electrode rod 14 projects at its ends from the caps 13 respectively and defines at one end an external terminal 15 for the assembly.

Mounted on the electrode rod 14 are a plurality of identical, annular magnets 16 and a plurality of identical, annular contact pieces 17, the magnets 16 and the contact pieces 17 being arranged alternately along the length of the rod 14. Each contact piece 17 has an external diameter substantially equal to the internal diameter of the casing and is provided with a plurality of equi-angularly spaced grooves 18 which communicate with the slots 12 respectively in the casing 11. Further, the grooves 18 are arranged so that their bases lie on a cylindrical surface of diameter greater than the external diameter of each of the magnets 16.

The assembly described above is intended to support a plurality of elongated, steel strips 19 (Figure 2) which are to be used as lead frames in the manufacture of semi-

conductor devices. Each of the strips 19 therefore includes a plurality of parts 21 which are to be electrically connected to the devices and further includes a bridging portion 22 which serves to support the parts 21 during manufacture of the lead frame. It is necessary to electro-plate with gold the parts 21 of each strip so as to ensure satisfactory electrical connection to the devices and the assembly described above is used to support the strips 19 during the electroplating process. The portion 22 of each strip is not required to be electroplated with gold and so to support each strip the portion 22 is inserted into a respective slot 12 in the casing 11. The portion 22 is then pushed into the groove 18 communicating with the slot 12 until the portion engages the bases of the grooves, where the portion is held by the attraction of the magnets 16. Thus, when supported by the assembly, the strips 19 are electrically connected to the terminal 15 by way of the contact pieces 17 and electrode 14. Then, by immersing the entire assembly in a gold electro-plating solution and making the necessary electrical connections to the terminal 15, an electric current can be passed through the plating solution to effect the required electro-plating of the strips 19. The arrangement is such that when the portion 22 of each strip is held within the casing 11 by the magnets 16, all the parts 21 of the strip project from the exterior of the casing 11 so that satisfactory plating of the parts 21 is ensured. Also, the dimensions of the slots 12 are arranged so that during the plating process when the portions 22 are received therein, there is little or no tendency for the plating solution to enter the slots. In this way, unnecessary plating of the portions 22 is substantially prevented. Further, as shown in Figure 1, the terminal 15 of the assembly is conveniently shaped to define a hook 23 by means of which the assembly together with the strips 19 can be suspended from a wall of the tank used to effect the electro-plating process.

Preferably, the contact pieces 17 are formed of a magnetic material so as to enhance the grip on the strips 19 and thereby improve the electrical connection between the terminal member 15 and the strips.

#### WHAT WE CLAIM IS:—

1. A support assembly for use in electroplating a workpiece in the form of an elongated strip formed of an electrically conductive material, including a casing formed with an elongated slot adapted to receive a portion of the workpiece so that, during electro-plating, the electro-plating solution is substantially prevented from coming into contact with said portion of the work-

piece, a terminal member to which external electrical connections can be made in use, a contact piece received within the casing and electrically connected to the terminal member, and a magnet received within the casing and so disposed relative to the contact piece and said slot that when said portion of the workpiece is inserted in the slot the portion is urged, by the attraction of said magnet, into engagement with the contact piece so that the workpiece is electrically connected to the contact piece and said terminal member.

2. An assembly as claimed in claim 1 wherein the contact piece is formed of a magnetic material.

3. An assembly as claimed in claim 1 wherein the contact piece is formed of steel.

4. An assembly as claimed in any one of claims 1 to 3 wherein the external surface of the contact piece presented to the slot in the casing defines a groove shaped so that said portion of the workpiece can be received therein, whereby when said portion of the workpiece is inserted into said slot the portion is urged by said magnet into said groove in the contact piece.

5. An assembly as claimed in any one of the preceding claims wherein an elongated electrode rod is supported in the casing and is electrically connected to the terminal member, and a plurality of contact pieces and magnets are mounted on the electrode rod and are arranged alternately along the length of the rod.

6. An assembly as claimed in claim 5 and including a plurality of said elongated slots in the casing angularly spaced around the longitudinal axis of the electrode rod whereby a plurality of said workpieces can be supported by the assembly.

7. An assembly as claimed in any one of the preceding claims wherein the terminal member extends from the casing to define means for suspending the assembly from the wall of an electro-plating bath.

8. A support assembly for a workpiece in the form of an elongated strip formed of an electrically conductive, magnetic material comprising the combination and arrangement of parts substantially as hereinbefore described with reference to the accompanying drawings.

9. A method of electro-plating a workpiece in the form of an elongated strip formed of an electrically conductive, magnetic material comprising the steps of supporting the workpiece in a support assembly as claimed in any one of the preceding claims, immersing the assembly and the workpiece in an electro-plating solution and passing an electric current through the solution to deposit an electro-plated coating on the workpiece, the required electrical

connection to the workpiece being made by way of the terminal member.

- 5 10. A workpiece in the form of an elongated strip formed of an electrically conductive magnetic material electro-plated by a method as claimed in claim 9.

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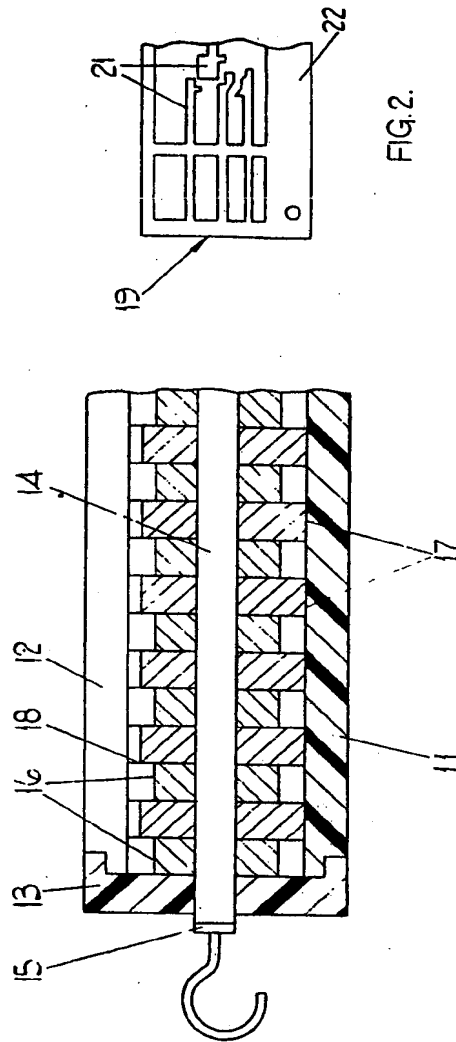


FIG. 1.

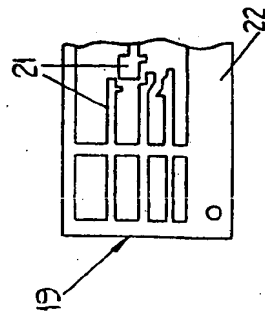


FIG. 2.